

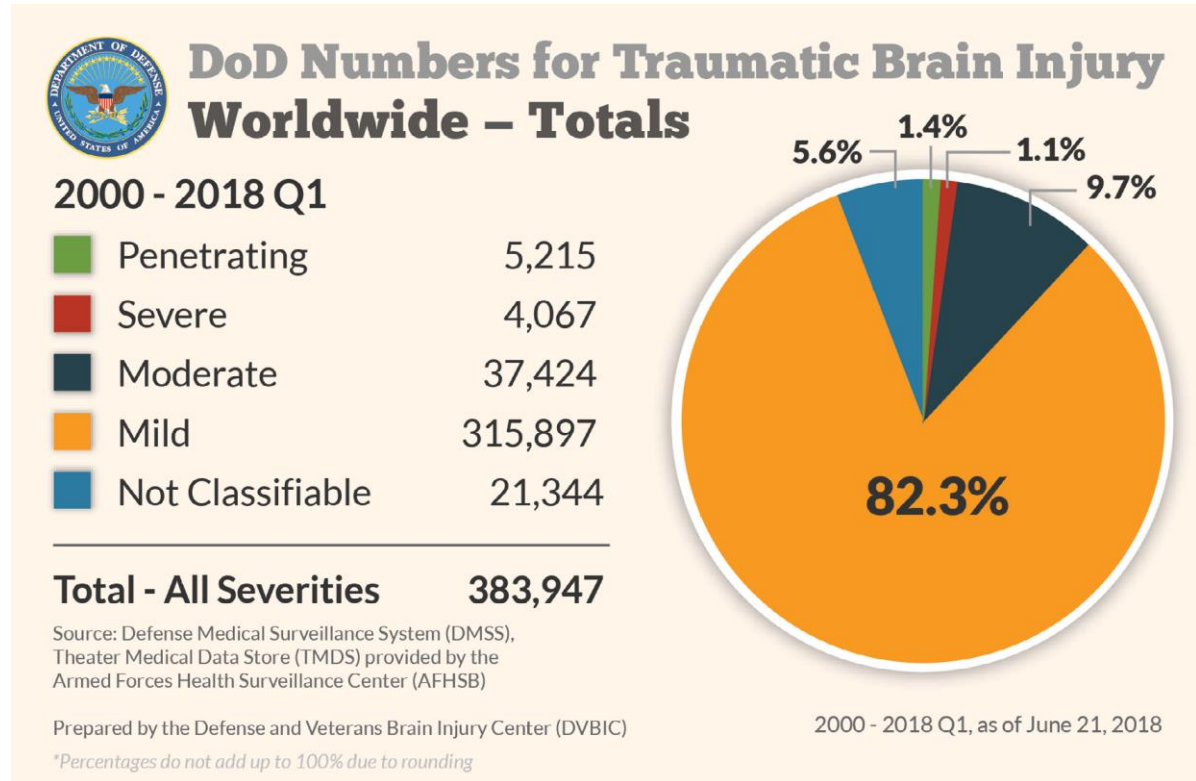
# **Treating Co-morbid PTSD and Traumatic Brain Injury When Cognitive Impairment is a Concern**

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# Traumatic Brain Injury



~20% of deployed Iraq/Afghanistan service members have experienced a TBI (Tanelian & Jaycox, 2008)



# Criteria for Severity of TBI

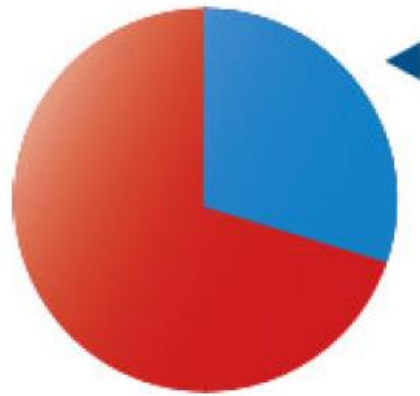
(If a patient meets criteria in more than one category of severity, the higher severity level is assigned)			
Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of Consciousness (LOC)	0-30 min	>30 min and <24 hours	>24 hours
Alteration of consciousness/ mental state (AOC)*	up to 24 hours	>24 hours; severity based on other criteria	
Posttraumatic amnesia (PTA)	0-1 day	>1 and <7 days	>7 days
Glasgow Coma Scale (GCS) (best available score in first 24 hours)**	13-15	9-12	<9

\*Alteration of mental status must be immediately related to the trauma to the head. Typical symptoms would be looking and feeling dazed and uncertain of what is happening, confusion, and difficulty thinking clearly or responding appropriately to mental status questions, and being unable to describe events immediately before or after the trauma event.

\*\*In April 2015, the DoD released a memorandum recommending against the use of GCS scores to diagnose TBI. See the memorandum for additional information.[\[3\]](#)



# Posttraumatic Stress Disorder



70% of U.S. Adults  
have experienced  
some form of  
trauma

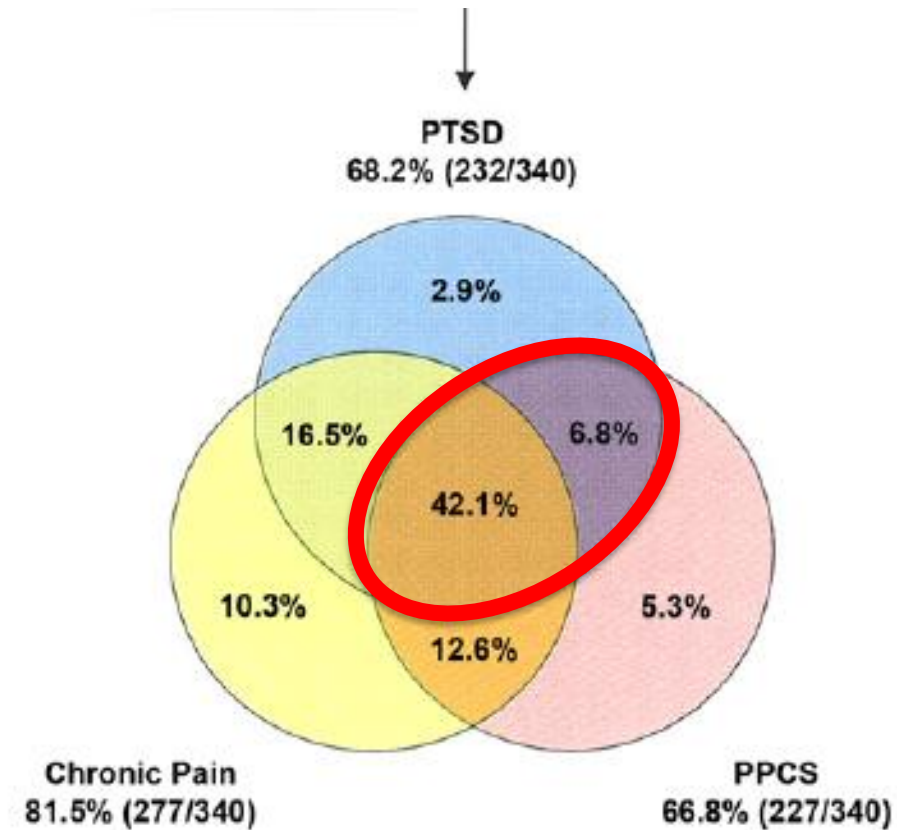


Up to 20% will  
develop PTSD

» 11-23% of Iraq and Afghanistan Veterans have PTSD



# Polytrauma Clinical Triad



Lew et al., 2009



# TBI Course

- Barring any intervening causes, the trajectory of recovery of cognitive symptoms is improvement or plateau
- In the majority of cases, cognitive symptoms of mild TBI resolve within 1 week
- In ~15% of cases, mTBI symptoms do not diminish as expected → persistent post-concussive syndrome (Belanger, Kretzmer, Vanderploeg, & French, 2009).
- No consistent relationship between symptom complaints and objective findings on:
  - Neuropsychological Testing
  - Physical Examination
  - Neurological Examination
- Psychological factors likely play a large role in symptom persistence in persistent symptoms following mTBI



# Neuropsychology of PTSD

- Cognitive deficits associated with PTSD (Vasterling et al. 2002)
  - Attention
  - Learning and verbal memory
  - Working memory
  - Executive functions – inhibition, interference
- Deficits align with limbic and paralimbic regions – prefrontal regions subserving arousal regulation and inhibition
- PTSD is associated with longer lasting cognitive difficulties than mTBI (Vasterling et al., 2012).
- May also be associated with worsening cognition over time
- Those with PTSD are twice as likely to develop dementia than those without (Yaffe et al., 2010).
- With time and ongoing symptoms, neuronal systems in those with PTSD may become overresponsive, leading to worsening cognition over time.
  - Stress sensitization - stress leads to changes in neurotransmitter/neurohormonal responses, that can create or exacerbate PTSD symptoms



# Persistent Postconcussive Symptoms

- Occur readily in healthy individuals with no history of concussion
- **No symptom unique** to only mild TBI
- Symptoms overlap with one or more other conditions

*Table 1. Percentages of Participants Endorsing Symptoms at a Mild or Moderate–Severe Level*

BC-PSI-Sf Items	Mild Endorsement (%)	Moderate–Severe Endorsement (%)
Headaches	52.4	2.9
Dizziness/light-headed	41.7	5.8
Nausea/feeling sick	37.9	3.8
Fatigue	75.7	13.6
Extra sensitive to noises	39.8	2.9
Irritable	71.8	11.7
Sad/down in the dumps	61.2	9.7
Nervous or tense	63.1	8.7
Temper problems	53.4	11.7
Poor concentration	61.2	15.5
Memory problems	50.5	13.6
Difficulty in reading	35.9	8.7
Poor sleep	62.1	12.6

*N* = 104.

(Iverson & Lange, 2003)

70-80% of healthy participants met DSM–IV (79.6%) or ICD-10 (72.1%) self-report criteria for Postconcussive Syndrome



# Veterans Presenting for Treatment of Cognitive Complaints

- Less than 30% of Veterans with a history of concussion had objective deficits upon formal testing
- ~85% had PTSD or other comorbid mental health concerns

Correlations between neurobehavioral symptoms, mental health symptoms, overall cognitive performance, and injury variables in the pass PVT group

Variable	BAI	NSI	PCL	Impaired tests	TBIs	LOC	PTA
				(n)	(n)	(min)	(min)
BDI	.65*	.57*	.51*	.11	-.02	-.06	.02
BAI		.70*	.52*	.04	.06	.01	.10
NSI			.54*	.04	.09	.06	-.09
PCL				.05	-.04	.04	.03
Impaired tests (n)					.09	.08	-.02
TBIs (n)						.02	-.01
LOC (min)							.20

(Jak et al., 2015)



# Dynamic relationship between comorbid PTSD and history of mTBI

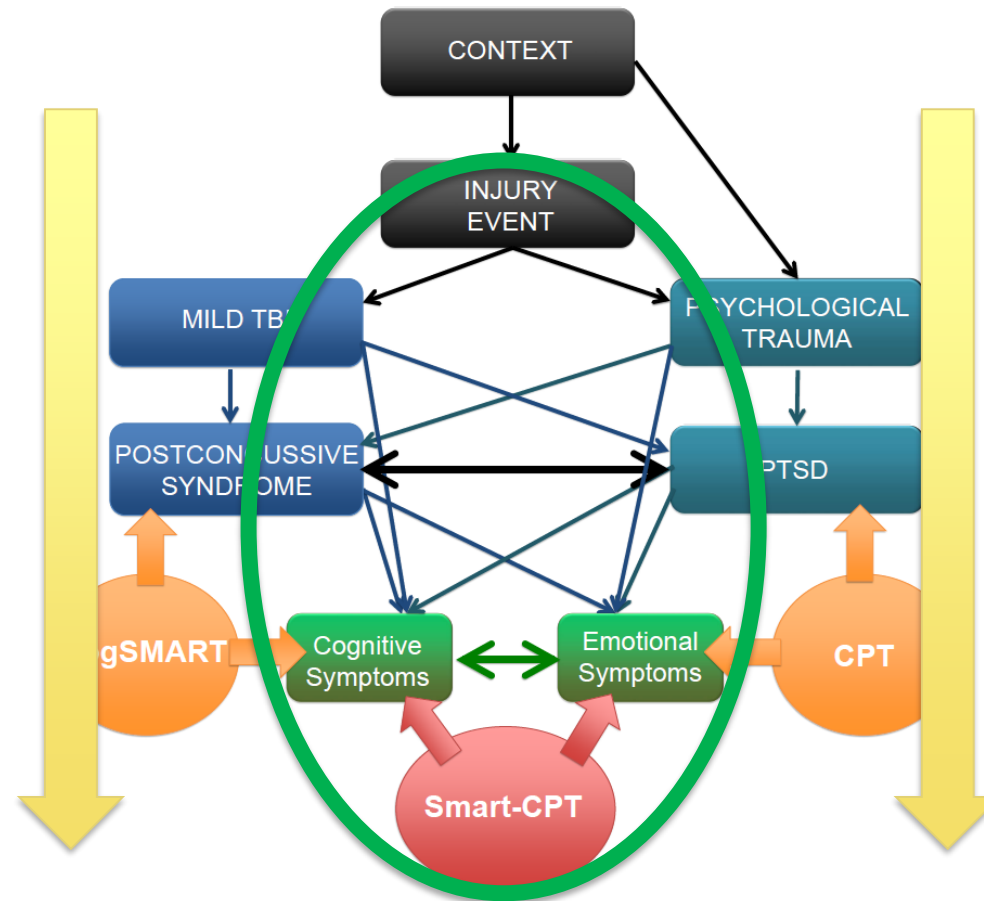


Fig. 1. Adapted from Vasterling, Bryant, and Keane (2012).





# Evaluation of a hybrid treatment for Veterans with comorbid traumatic brain injury and posttraumatic stress disorder: Study protocol for a randomized controlled trial



Amy J. Jak<sup>a,b,d,e</sup>, Robin Aupperle<sup>a,1</sup>, Carrie S. Rodgers<sup>b,d,2</sup>, Ariel J. Lang<sup>b,d,3</sup>, Dawn M. Schiehser<sup>c,d,h,2</sup>, Sonya B. Norman<sup>a,b,d,f,2</sup>, Elizabeth W. Twamley<sup>b,d,4</sup>

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<sup>c</sup> Research Service, VA San Diego Healthcare System, United States

<sup>d</sup> Department of Psychiatry, University of California San Diego, United States

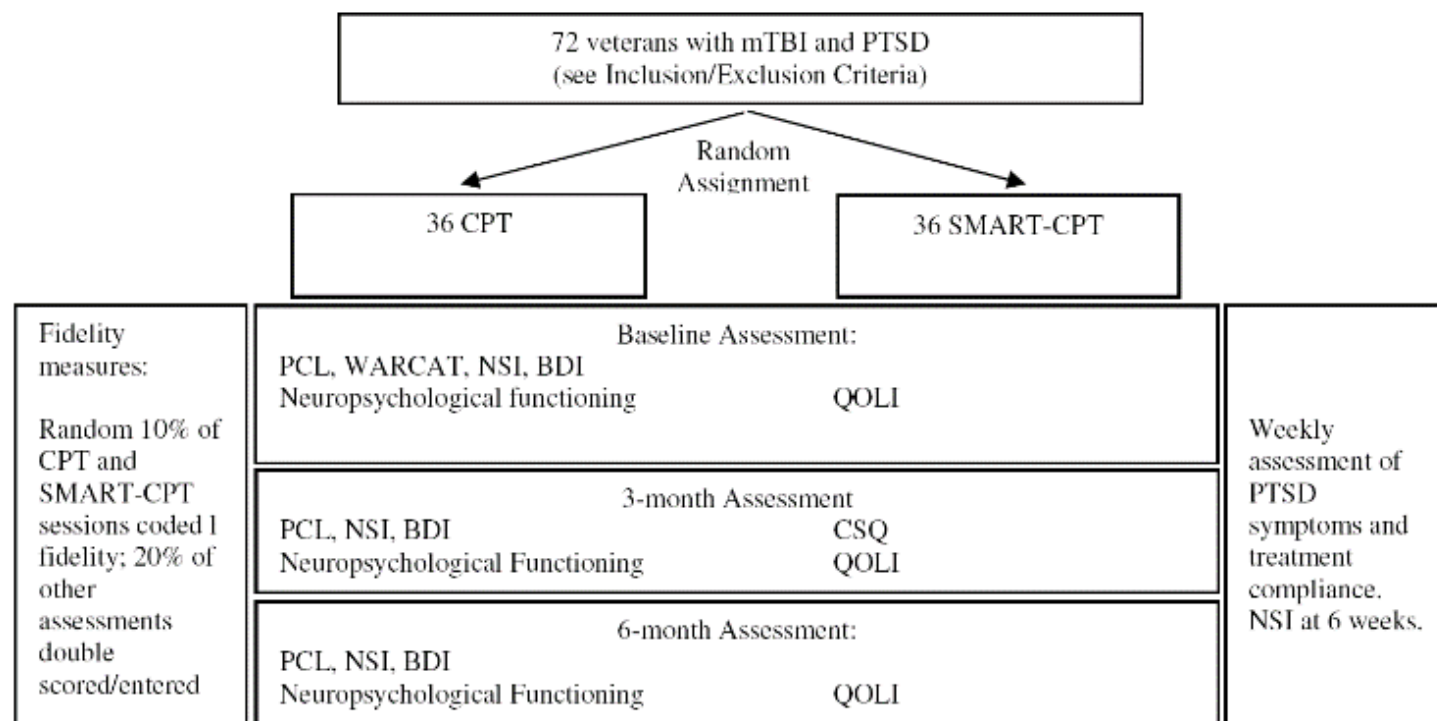
<sup>e</sup> Lawrence Institute for Brain Research, University of Texas, United States

<sup>f</sup> National Center for PTSD, White River Junction, VT, United States

## RESEARCH PAPER

## SMART-CPT for veterans with comorbid post-traumatic stress disorder and history of traumatic brain injury: a randomised controlled trial

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# Interventions

- SMART-CPT: Incorporates TBI psychoeducation, compensatory strategies for attention, memory, and executive functioning, more concrete language, written and verbal repetition and reviews of key CPT points, and simplified and restructured homework pages into standard CPT.
  - 12 sessions, est. 75 minutes each (actual avg. 86 min.)
  - Veteran provided with manual with all in-session material, handouts, and homework
- CPT – strategies for challenging maladaptive thought processes related to trauma
  - 12 sessions, est. 60 minutes each (actual avg. 73 min)
  - Veteran provided with homework handouts



# SMART-CPT Modifications

CogSMART strategies integrated into CPT:

- Active breaks
- Self-talk
- Calendar use – remember appts/homework & other important activities, organize time/priorities including to-do lists
- Home for important items
- Strategic reminders (notes/visual cues, alarms)
- Visual imagery
- Retrieval strategies
- Goal setting and planning
- Brain storming and problem solving



# SMART-CPT Modifications

- Provide written copies of session agendas and session reviews
- Patient handouts include written summaries of key topics discussed orally in session
  - » E.g., PTSD symptoms, fight/flight/freeze, just world belief, natural vs manufactured emotions, hindsight bias, self blame, five themes
- Color-coded A-B-C and challenging beliefs worksheets (CBWs) to clearly separate sections
- CBWs are also simplified
- More concrete language
- Repetition of key points
- Built-in breaks

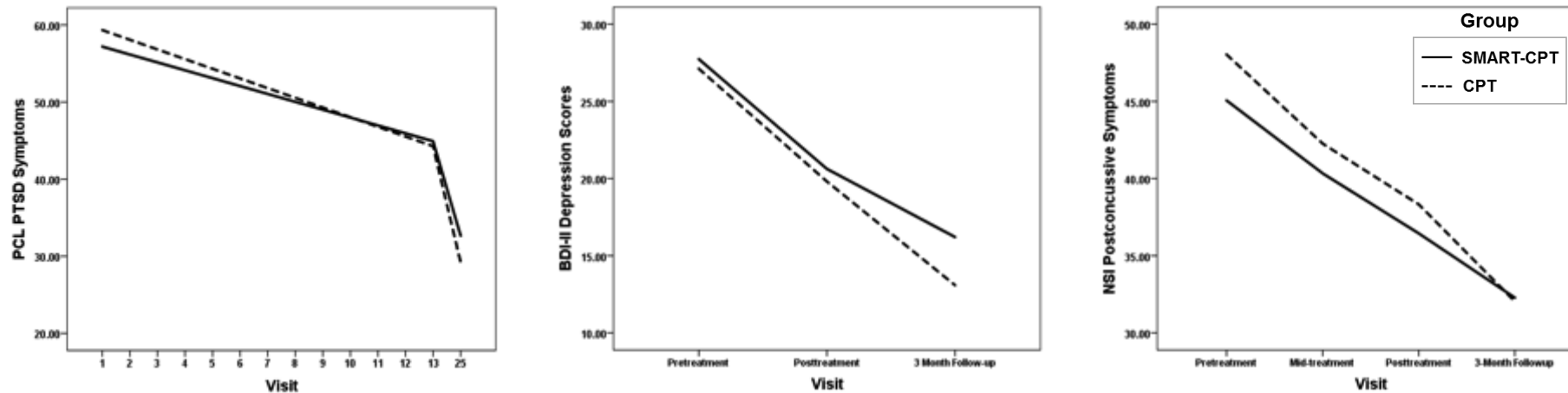


# Participants

	Total Sample (N=100)	CPT-C (N=49)	SMART-CPT (N=51)	t, $\chi^2$ , or F (df)	p
Age, years	34.39 (7.89)	33.94 (7.27)	34.82 (8.50)	-.56 (98)	.578
Education, years	13.69 (1.83)	13.88 (1.65)	13.51 (1.98)	1.00 (98)	.317
Male, %	89.0%	87.8%	90.2%	$\chi^2=.15$ (1)	.758
Non-Caucasian, %	53%	59.2%	47.1%	$\chi^2=1.48$ (1)	.155
Loss of Consciousness, minutes <sup>a</sup>	4.50 (8.84)	5.49 (8.90)	3.61 (8.78)	1.05 (95)	.297
Number of TBIs	2.81 (1.92)	2.90 (1.99)	2.73 (1.87)	.44 (97)	.661
Percentage Service Connection Treatment	57.10 (38.70)	56.73 (37.88)	57.45 (39.84)	-.09 (98)	.927
Treatment Completion, %	53.0%	49.0%	56.9%	$\chi^2=.62$ (1)	.548
Prior PTSD Treatment, %	57.0%	55.1%	58.8%	$\chi^2=.14$ (1)	.840
Prior Cognitive Rehabilitation, %	1.0%	2.1%	0%	$\chi^2=1.03$ (1)	.495
Total sessions completed	7.96 (4.74)	7.37 (4.95)	8.53 (4.51)	-1.23 (98)	.222
Average time per session, minutes	79.77 (19.24)	72.65 (16.06)	86.03 (19.77)	-3.53 (90)	.001
Symptom Severity					
PCL-S	59.35 (10.65)	61.06 (9.92)	57.63 (11.17)	1.61 (96)	.111
NSI	46.56 (14.12)	48.61 (14.92)	44.51 (13.10)	1.45 (96)	.151
BDI-II	27.68 (10.27)	27.29 (9.62)	28.06 (10.96)	-.37 (95)	.714
Cognitive <sup>b</sup>					
WRAT Reading	97.02 (10.00)	97.08 (10.63)	96.96 (9.44)	.27 (1,95)	.603
WAIS-IV Processing Speed Index	91.51 (13.21)	90.10 (15.18)	92.88 (10.93)	.22 (1,94)	.639
CVLT-II 1-5 Learning Total	45.37 (9.93)	43.35 (9.72)	47.39 (9.83)	3.25 (1,95)	.075
CVLT-II SDFR	-.54 (.96)	-.67 (.93)	-.40 (.98)	.85 (1,95)	.358
CVLT-II LDFR	-.69 (1.13)	-.86 (1.07)	-.52 (1.19)	.79 (1,95)	.376
WAIS-IV Digit Span	8.36 (2.59)	8.35 (2.53)	8.38 (2.67)	.64 (1,96)	.426
D-KEFS Trail-Making	8.85 (2.78)	8.73 (2.77)	8.96 (2.81)	.02 (1,94)	.879
Number-Letter Switching					
D-KEFS Color Word Inhibition	7.80 (4.04)	7.66 (4.45)	7.94 (3.65)	.05 (1,93)	.829
WCST-64 Total Errors	48.08 (8.90)	48.06 (8.93)	48.10 (8.97)	.04 (1,94)	.835
TOMM Trial 2	47.45 (4.54)	46.69 (5.29)	48.18 (3.58)	-1.65 (98)	.103
TOMM Retention Trial	46.80 (5.54)	45.94 (6.59)	47.63 (4.20)	-1.53 (98)	.128
QOLI-B General Life Satisfaction	4.07 (1.30)	4.19 (1.21)	3.96 (1.38)	.86 (95)	.390



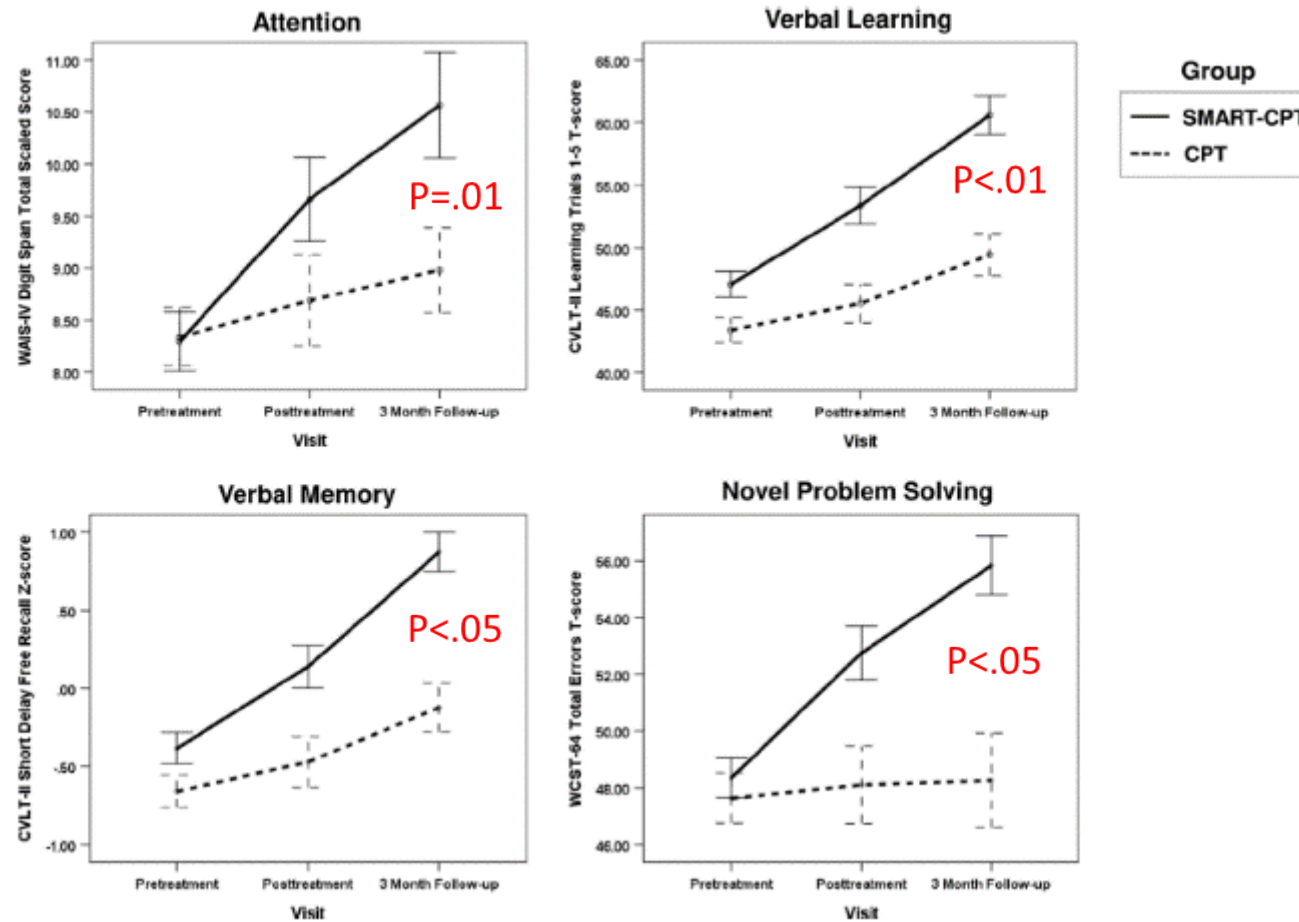
# Change in Mental Health and Neurobehavioral Symptoms



- Statistically and clinically significant improvement in PTSD, depression, and postconcussive symptoms - No group differences
- Similarly, significant improvement in quality of life (general life satisfaction, daily activities, family, health), but no group differences



# Change in Cognitive Functioning





Contents lists available at ScienceDirect

## Journal of Psychiatric Research

journal homepage: [www.elsevier.com/locate/jpsychires](http://www.elsevier.com/locate/jpsychires)



### Mild traumatic brain injury characteristics do not negatively influence cognitive processing therapy attendance or outcomes



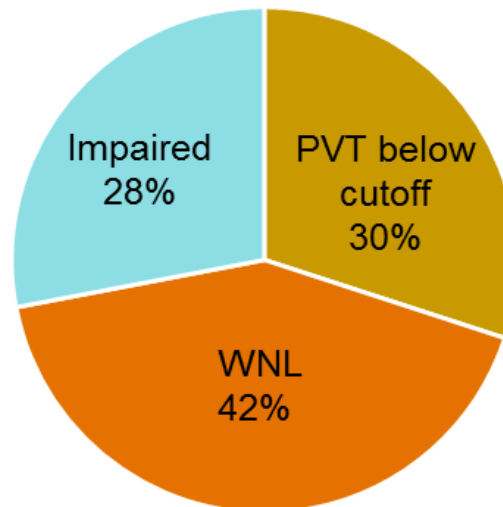
Laura D. Crocker<sup>a,b,\*</sup>, Sarah M. Jurick<sup>b,c</sup>, Kelsey R. Thomas<sup>d</sup>, Amber V. Keller<sup>a</sup>, Mark Sanderson-Cimino<sup>e</sup>, Samantha N. Hoffman<sup>a</sup>, Briana Boyd<sup>f</sup>, Carie Rodgers<sup>g</sup>, Sonya B. Norman<sup>b,d,h</sup>, Ariel J. Lang<sup>b,d</sup>, Elizabeth W. Twamley<sup>a,b,d</sup>, Amy J. Jak<sup>b,c,d</sup>

- Injury variables do not moderate treatment response
- History of mTBI should not preclude individuals from receiving CPT, regardless of injury characteristics.



# Veterans Presenting for Treatment of Cognitive Complaints

- Less than 30% of Veterans with a history of concussion had objective deficits upon formal testing
- ~85% had PTSD or other comorbid mental health concerns



# Performance Validity

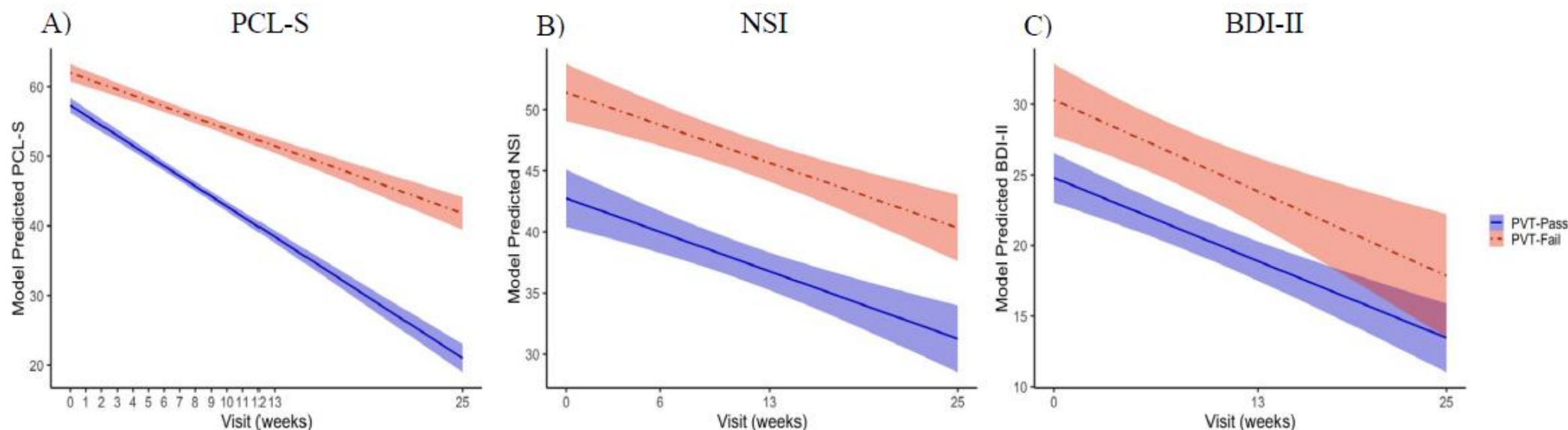


Figure 1. Graphical depictions of the MLM results predicting symptom change. Gray shading represents 95% confidence intervals. A) PCL-S = Posttraumatic Stress Disorder Checklist – Specific Trauma, B) NSI = Neurobehavioral Symptom Inventory, C) BDI-II = Beck Depression Inventory - Second Edition.

Both PVT groups experienced improved psychological symptoms following treatment.

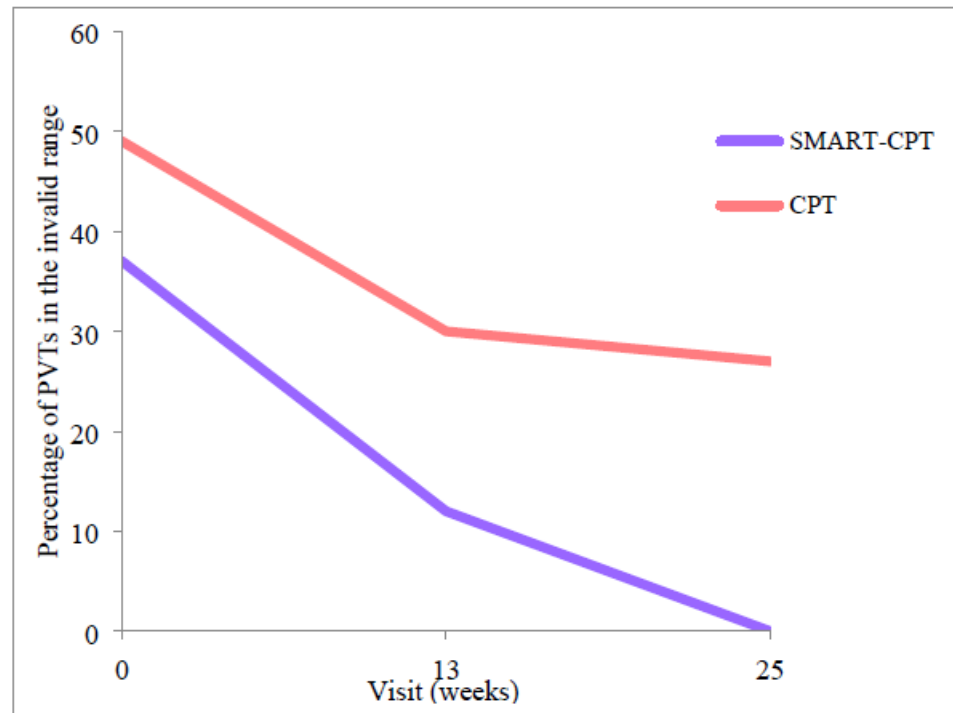


Figure 2. Percentage of Veterans with one or more performance validity tests in the invalid range at each assessment. PVT = performance validity test; CPT = Cognitive Processing Therapy; SMART-CPT = Hybrid treatment combining cognitive processing therapy (CPT) for PTSD with components of compensatory cognitive training from Cognitive Symptom Management and Rehabilitation Therapy (CogSMART).

- Veterans who failed PVTs at baseline demonstrated better test engagement following treatment, resulting in higher rates of valid PVTs at follow-up.



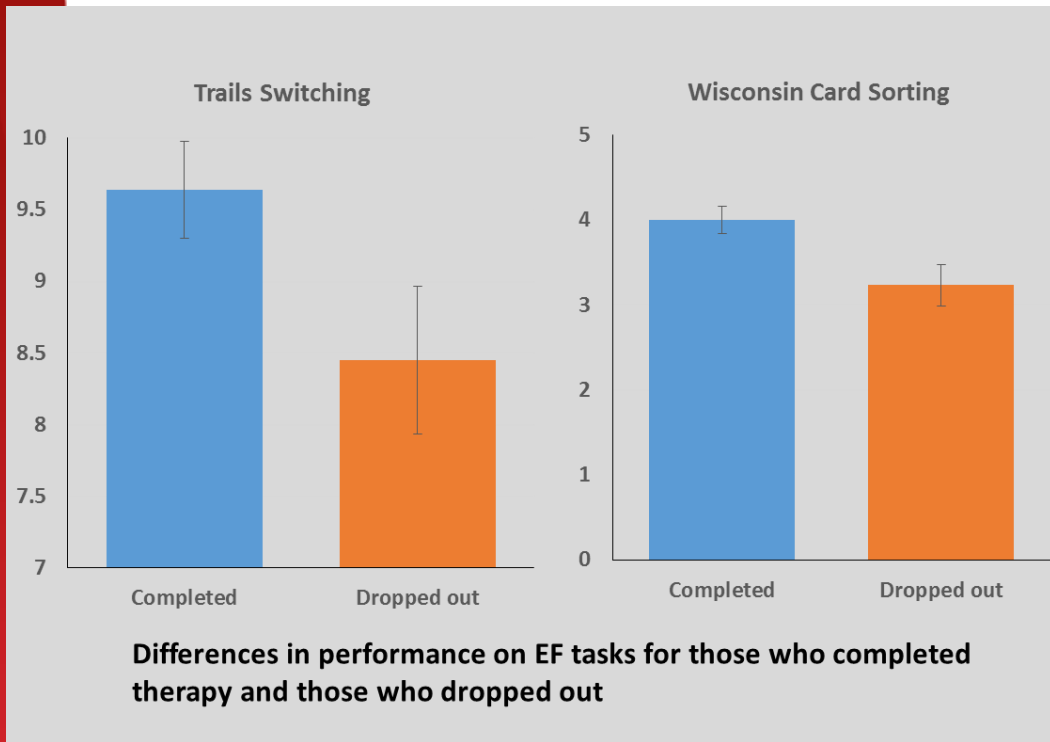
# Importance of Executive Functioning

- **Examined whether baseline measures of EF were associated with treatment attendance/drop-out and response in SMART-CPT data**
  - » Working memory: WAIS-IV Digit Span Sequencing
  - » Cognitive flexibility: D-KEFS Trail Making Test number-letter switching condition
  - » Inhibition: D-KEFS Color Word Interference Test inhibition condition
  - » Inhibition/cognitive flexibility: D-KEFS Color Word Interference Test inhibition/switching condition
  - » Novel problem solving: Wisconsin Card Sorting Task
- **Only included individuals who passed effort measures at baseline (n = 74)**

Crocker et al., 2018



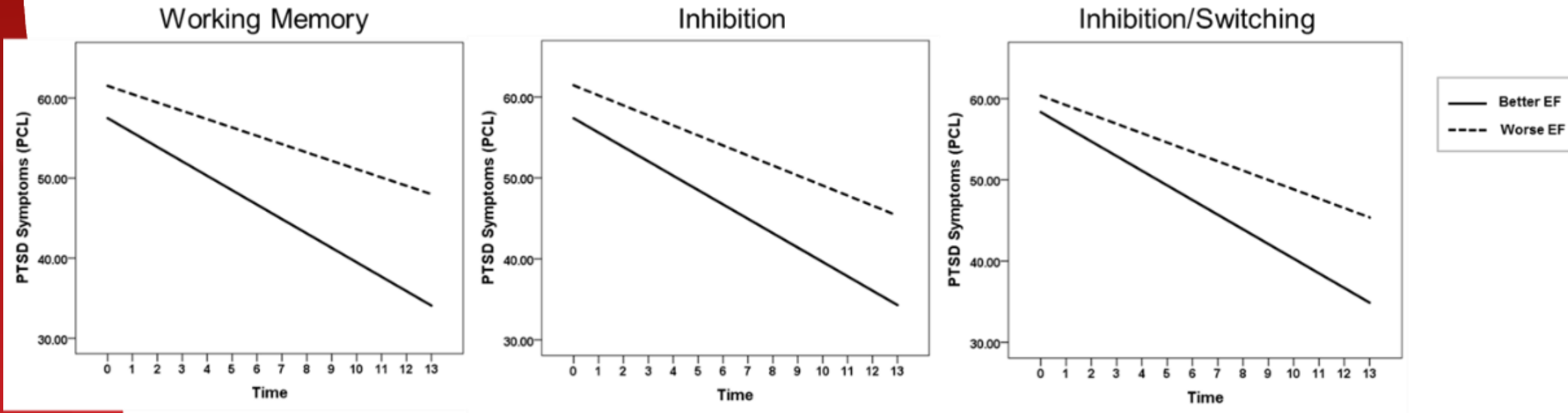
# Executive Functioning and Treatment Completion



- Those who dropped out of treatment had worse executive functioning at baseline relative to those who completed treatment
- Measures of memory did not predict CPT response – results were specific to EF



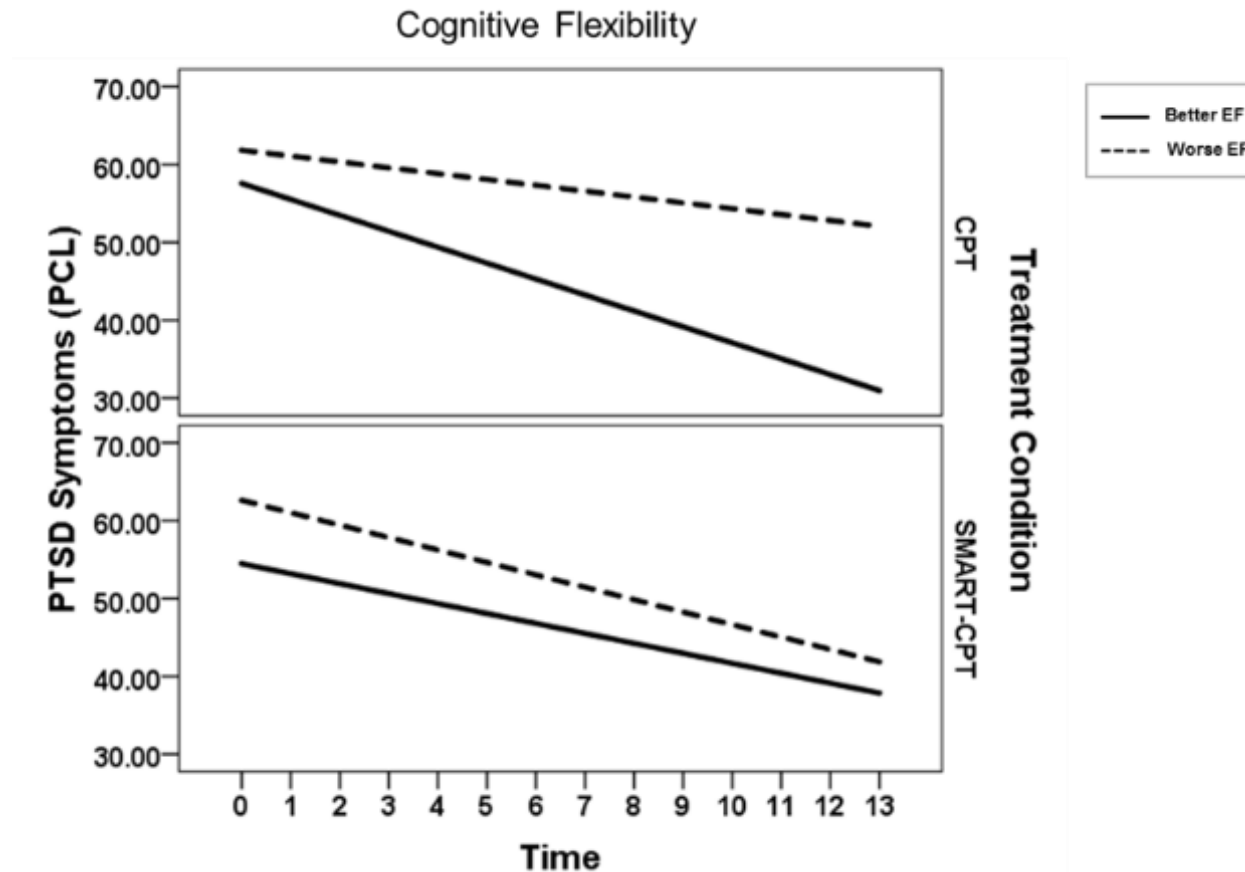
# Executive Function and CPT Response



- Baseline measures of EF predicted change in PTSD symptoms
- Worse performance on multiple executive function tests at baseline was associated with poorer response to CPT



# Executive Function and CPT Response

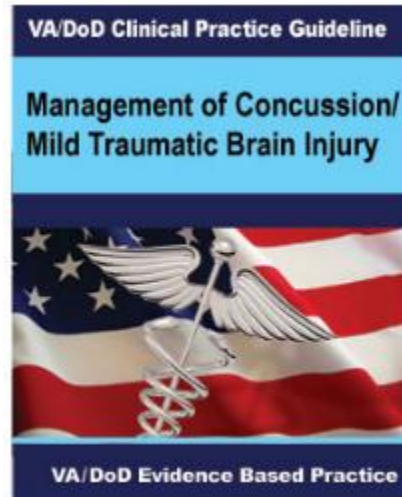


Three-way interaction indicating that individuals with worse baseline cognitive flexibility did not benefit as much from standard CPT but demonstrated significant PTSD symptom improvement in the SMART-CPT condition, comparable to those with better baseline cognitive flexibility.



# Treatment Recommendations

- VA/DoD guidelines state that co-occurring disorders should not prevent Veterans from receiving empirically supported treatments for PTSD and in fact assert that treatment of mood and pain are first line treatments.
- Research supports this guideline - history of TBI should not preclude trauma-focused therapies (Ragsdale & Horrell, 2016; Walter et al., 2014; Davis et al., 2013)



# Summary

- Both CPT and SMART-CPT resulted in clinically significant reductions in PTSD and post-concussive symptomatology as well as improvements in quality of life
- Adding compensatory cognitive strategies to mental health treatment does provide differential benefit in the cognitive domains of attention, learning/memory, and novel problem solving
- Targeting executive functioning skills may be particularly important for both treatment retention and symptom reduction
- Veterans with invalid neuropsychological testing should be enrolled in trauma-focused treatment, and may benefit from neuropsychological assessment after, rather than before, treatment
- Individuals with a history of concussion and persistent post-concussive symptoms can successfully complete structured and empirically supported mental health therapies with or without modifications



# Thank you!

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questions in the Q&A box  
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*The lines are muted to avoid background noise.*



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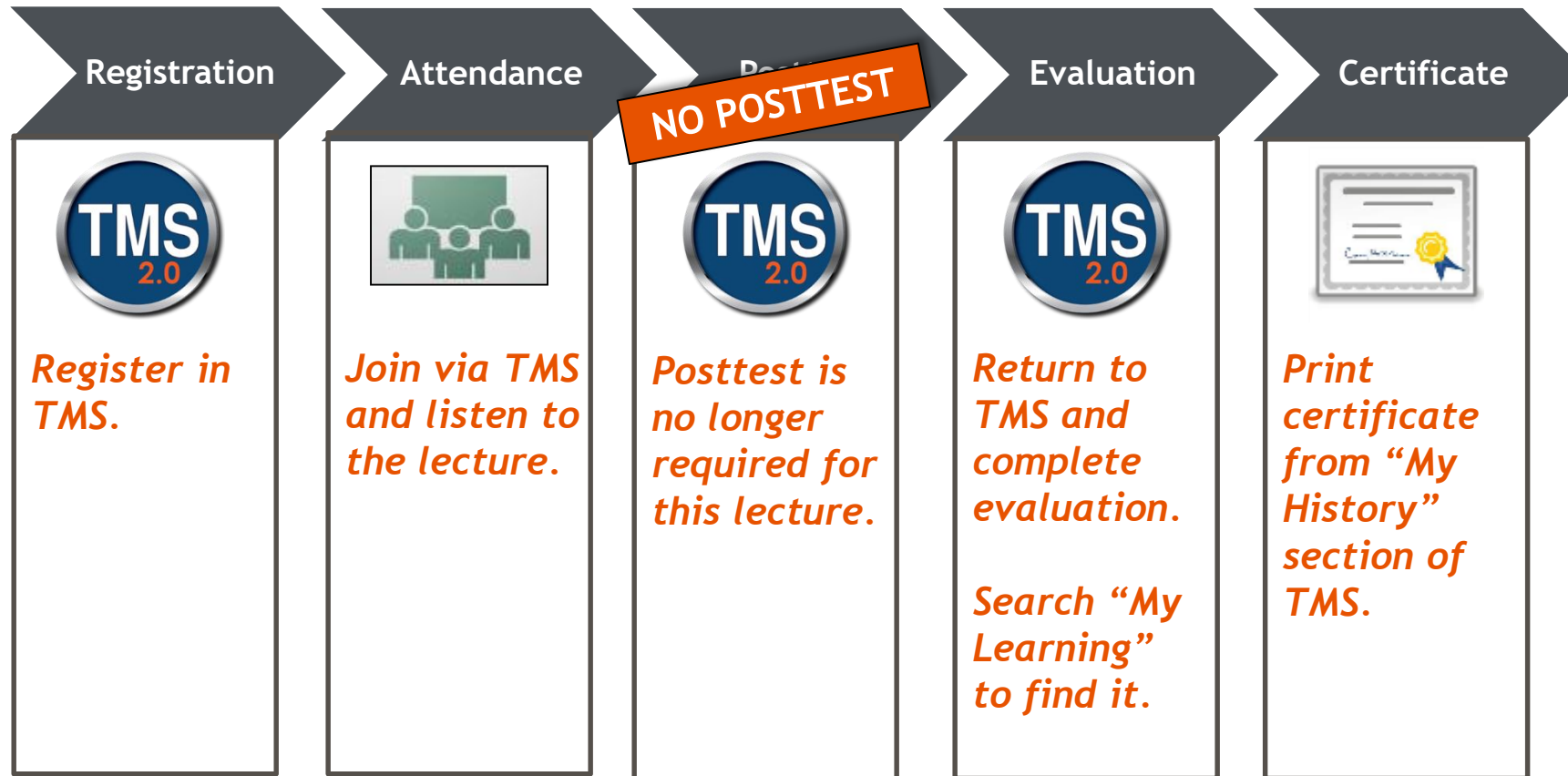


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## CEU Process (for VA employees)





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### UPCOMING TOPICS

***SAVE THE DATE: Third Wednesday of the Month from 2-3PM (ET)***

<b>October 16</b>	<i>Unconventional Interventions for PTSD: State of the Evidence</i>	Paul Holtzheimer, MD
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<b>November 20</b>	<i>Addressing Sleep: A Strategy for Symptom Reduction &amp; Suicide Prevention?</i>	Wilfred Pigeon, PhD
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<b>December 18</b>	<i>Treating Comorbid PTSD and Borderline Personality Disorder</i>	Melanie Harned, PhD, ABPP
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<b>January 15</b>	<i>Dissociation, Somatization, and Other Challenging Presentations of PTSD</i>	Abigail Angkaw, PhD
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<b>February 19</b>	<i>Concurrent Treatment of PTSD and SUDs using Prolonged Exposure (COPE)</i>	Sudie Back, PhD
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